

ABSTRACT OF THE DISCLOSURE

The invention provides methods for enhancing efficiency of prodrugs by specifically engineered enzymes with enhanced activity towards nucleoside analogs used in cancer chemotherapy, and delivering the enzymes to specific target cells in a patient.

- 5 The invention also provides modified deoxycytidine kinase (dCK) mutants with such enhanced activity. Furthermore, the invention provides antibody-conjugated enzymes that can be specifically delivered to leukemic blast cells *in vivo* or *ex vivo*.